National Air Toxics Assessment (NATA) for 1999

Summary of Results

Iowa Department of Natural Resources
Air Quality Bureau

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The U.S. Environmental Protection Agency (EPA) recently released an updated assessment of the nationwide health risk estimates for air toxics.

This is the second analysis of this kind. EPA first released such an assessment in 2002 for emission year 1996. Because of the difference in methodologies between the NATA for 1996 and 1999, the two assessments should not be compared. Information on the 1999 NATA, including a Technical Fact Sheet, is available at www.epa.gov/ttn/atw/nata1999.

Toxic air pollutants, or air toxics, are those pollutants known or suspected of causing cancer or other serious health problems. EPA's latest assessment covers 177 of the Clean Air Act's list of 188 air toxics, plus diesel particulate matter.

EPA conducted the 1999 NATA to provide a snapshot of air quality and risks that would result if 1999 emission levels remained unchanged. It does not reflect numerous reductions in air toxics that have occurred since 1999, or are expected to occur in the future.

EPA developed NATA as a tool for state and local agencies and other interested groups to prioritize activities to identify pollutants of concern, the locations of interest, and the primary sources of air toxics. The assessment is not designed as a definitive means to pinpoint specific risk values within a census tract, or to characterize or compare risks at local levels such as between neighborhoods.

Nationwide Results

Cancer Risks

For reporting cancer results, EPA focused on pollutants whose risks were above the specified level of 1 in one million. This level is not a regulatory level, but is simply a level at which there is a potential for adverse health effects.

EPA estimated that the majority of the country is predicted to have a risk between 1 and 25 in a million. This means that out of one million people, between 1 and 25 people have increased likelihood of contracting cancer as a result of breathing air toxics from outdoor sources, if they were exposed to 1999 levels over the course of a lifetime. Most urban locations had risks greater than 25 in a million. The average, nationwide cancer risk for 1999, when averaging the values for all counties, was 42 in a million.

In contrast, one out of every three Americans (330,000 in a million) will contract cancer during a lifetime, when all causes are taken into account. Smoking and lifestyle factors comprise approximately two thirds of the overall cancer risk. As an additional comparison, the estimated cancer risk from indoor exposure to radon is 2,000 in a million (1 in 500).

Based on these results, EPA has determined that that the risk of contracting cancer is increased by **less than 1%** due to inhalation of air toxics from outdoor sources.

EPA estimated that benzene was the most significant contributor to air toxic emissions for which a cancer risk could be estimated. The key source of benzene nationally is on-road vehicles, which comprise approximately 49% percent of emissions. EPA projects that benzene emissions will decrease by about 60% between 1999 and 2020 as a result of motor vehicle standards and other emissions reduction programs.

Noncancer Risks

For reporting noncancer risks, EPA focused on pollutants whose risks were above a hazard quotient (HQ) of 1. The HQ is a ratio between the exposure and reference concentrations. This level is not a regulatory level, but is simply a level at which there is a potential for adverse health effects.

The EPA calculated the HQ for each pollutant and then combined these HQs for air toxics that affect the same target organ or organ system to determine the hazard index (HI). EPA reported HQ and HI results for respiratory and neurological effects. As with the HQ, EPA focused on pollutants whose risks were above an HI of 1.

For most of the noncancer health effects assessed by EPA, the estimated exposures were below levels at which adverse health effects are expected. Respiratory health effects show a considerably higher potential for adverse effects to the greatest number of people when compared with other effects, such as neurological effects.

According to EPA's assessment, over 40% of U.S. counties, and 92% of the U.S. population, had a HI for respiratory toxicity of greater than 1. The average, nationwide, HI for 1999 was 6.5.

Of the 40 air toxics showing the potential for respiratory effects, acrolein is the most significant, contributing to 86 percent of the nationwide average noncancer hazard identified in this assessment. The key sources of acrolein are open burning, prescribed fires and wildfires (61%), followed distantly by on-road vehicles (14%).

The apparent dominance of acrolein as a noncancer “risk driver” in both the 1996 and 1999 NATA is driving EPA to develop an effective monitoring test method for this pollutant. EPA projects that acrolein emissions from on-road sources will be reduced by 53% between 1996 and 2020 as a result of existing motor vehicle standards and fuel controls.

Results for Iowa

The NATA results for Iowa show that the carcinogenic risk and noncancer risk are quite low throughout most of the state, and are generally lower than the national average and median risk values. Some urban counties do show higher risk levels, which are consistent with urban risk levels found nationwide.

Cancer Risks at the County Level

According to EPA's assessment from the 1999 data, the vast majority of Iowa's counties show a cancer risk between 1 and 25 in a million. The counties in Iowa showing a cumulative cancer risk of between 25 and 50 in a million include: Black Hawk, Johnson, Linn, Polk, Pottawattamie, and Scott. No county in Iowa showed average or median cancer risk of greater than 50 in a million.

The pollutant with the greatest contribution to estimated cancer risk in most of Iowa's urban counties was benzene. As noted above, the vast majority (almost half) of benzene emissions come from on-road mobile sources such as cars and trucks.

Noncancer (Respiratory) Risks at the County Level

Most of Iowa's counties showed a Hazard Index (HI) or a Hazard Quotient (HQ) of less than 1.0. This suggests that residents within these counties would have exposures to air toxics that are likely to be without appreciable risk of noncancer, adverse respiratory effects during their lifetime.

Iowa counties estimated to have median or average HIs of between 1 and 2 include Cedar, Cerro Gordo, Clinton, Dallas, Dubuque, Mills, Muscatine, Story, Warren, and Woodbury. Iowa counties estimated to have median or average HIs between 2 and 3 include Johnson, Linn, Polk, Pottawattamie and Scott. No county in Iowa showed a median or average HI of greater than 3.

In counties with HIs greater than 1, acrolein was, by far, the most significant contributor. Onroad mobile sources were the greatest contributor to acrolein emissions in these counties.

Next Steps

Because NATA has many limitations in its data and results, it may only be used as an indicator and a tool for setting priorities for further analysis. The determination of what is an acceptable or unacceptable risk depends on additional factors and more refined information. This is a significant issue that is not addressed in the 1999 NATA risk characterization.

Since 1999, the Department of Natural Resources (Department) adopted over 50 federal air toxics regulations for industry source categories. These regulations have contributed to an overall reductions in air toxics throughout the state. According to the emissions inventories submitted to the Department for 2004 (the most data currently available), total air toxics emissions from major industrial sources decreased by over 4,000 tons, statewide, from 1999 levels.

Industrial sources, however, are not the only contributor to air toxics in Iowa. Onroad mobile sources are a significant contributor to air toxics in urban areas, both nationally and in Iowa. This indicates a need for EPA, in partnerships with state and local agencies, to continue reducing air toxics emissions from cars and trucks through current and future mobile source standards and other initiatives.

The Department continues to compile annual emissions inventories of air toxics and other pollutants. The Department's emissions inventory results for major sources of air pollutants were not used by EPA in the 1999 NATA, but will be used for future assessments. This should result in more accurate data. Further, the Department will audit the emissions inventories for areas of concern to ensure reporting accuracy. The Department may also consider using the most current inventory data to conduct air dispersion modeling to better assess air toxics levels in areas of concern.

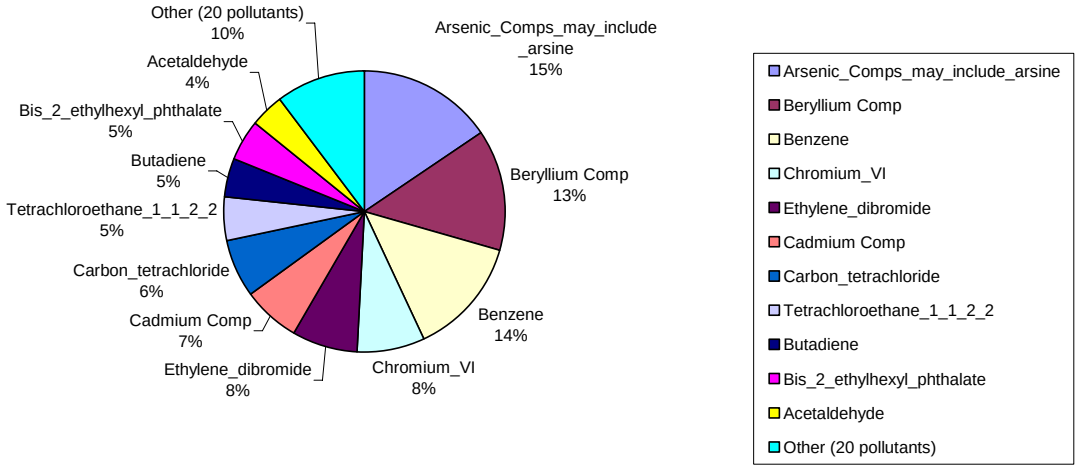
Based on the results of the 1996 NATA, the Department began monitoring acetaldehyde, benzene and formaldehyde in Davenport (Scott County), Cedar Rapids (Linn County), and Des Moines (Polk County) in 2003. The Department will continue to monitor these air toxics in these locations, as long as funds to support the monitoring are available.

Scott County

Scott County includes the city of Davenport, and is one of the counties comprising the Quad Cities area. EPA estimated that the average, cumulative cancer risk in Scott County, for 1999, was 49 in a million (the median value was estimated at 46 in a million). These were the highest cumulative cancer risk values found in Iowa. However, the risk value assessed for Scott County was only slightly above the nationwide average cumulative cancer risk of 42 in a million.

As illustrated in the chart below, EPA determined that the pollutants contributing the most to the Scott County cancer risk values were arsenic (15%), benzene (14%), and beryllium (13%). A combination of 20 other pollutants contributed to approximately 10% of the cumulative cancer risk. Several other individual pollutants contributed to smaller percentages of the total, estimated risk.

Scott County, IA: Pollutant Contributions to Cancer Risk

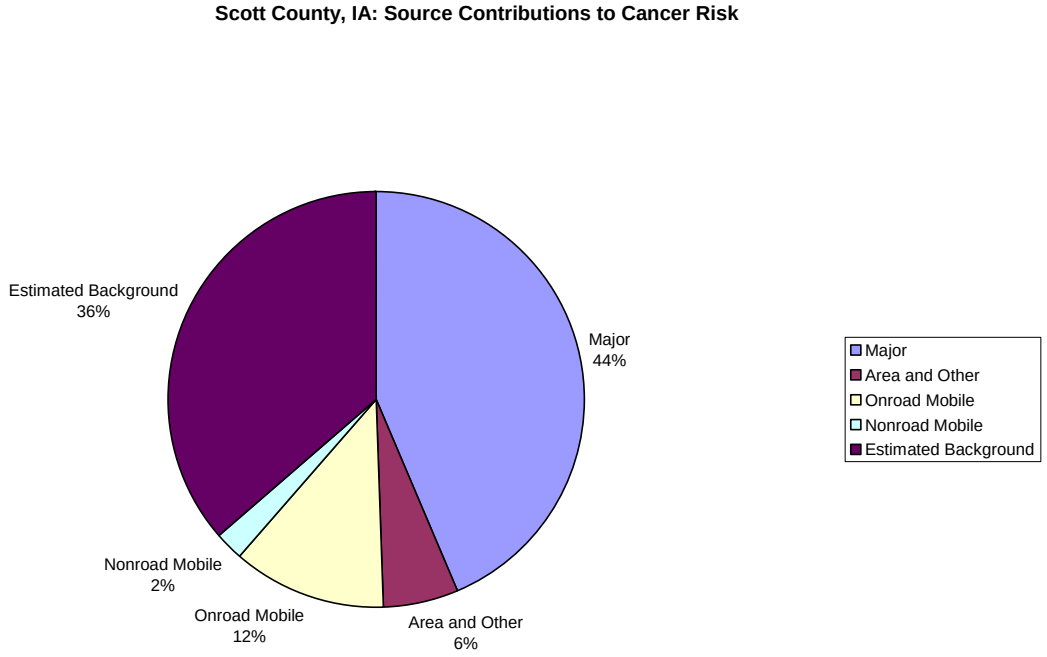


Unlike most other urban areas in Iowa and nationwide, EPA also found that arsenic contributed slightly more than benzene to the estimated cancer risk in Scott County. Beryllium was also a contributor, but at a slightly lower level than benzene.

It is unclear why arsenic and beryllium were found to be significant contributors to cancer risk in Scott County. Emissions of arsenic and beryllium were not exceptionally high. In fact, Scott County was only the tenth highest county in the state in total arsenic emissions in 1999. Beryllium emissions in Scott County were also not one of the highest in the state.

Combustion of coal and other fossil fuels for electricity generation, industrial processes, and commercial, institutional and residential heating are the primary sources of arsenic and beryllium emissions in Scott County, as well as nationally.

The chart below shows EPA's assessment that the primary sources contributing to the cumulative cancer risk in Scott County were major stationary sources (44%), background concentrations (36%) and onroad mobile sources (12%). Background concentrations include air toxics emissions from long range transport within the U. S. and globally, and contributions from natural sources.



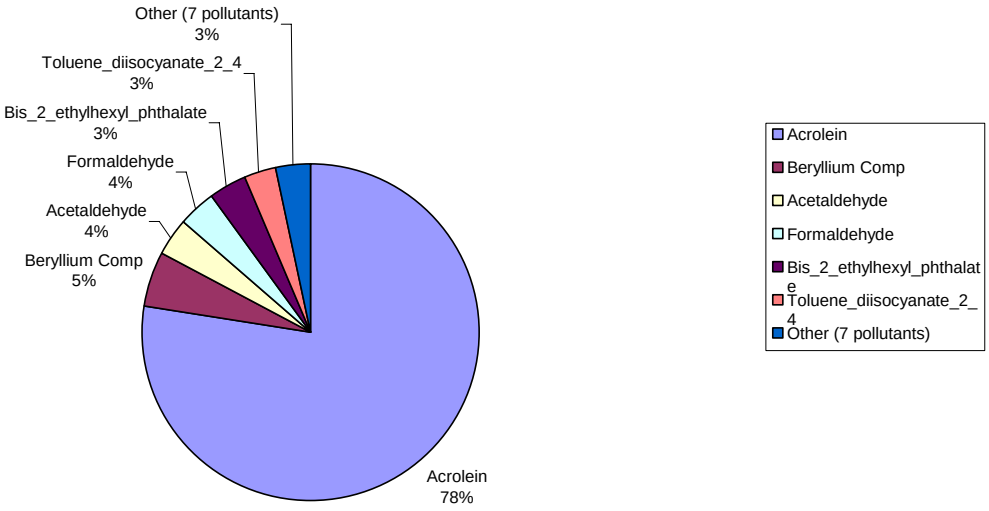
Unlike other urban areas in Iowa, major stationary sources in Scott County were found to contribute more than onroad mobile sources to the cumulative cancer risk. It should be noted, however, that background concentrations contributed almost as much as major sources. Background concentrations were also a significant contributor to cancer risk at the national level.

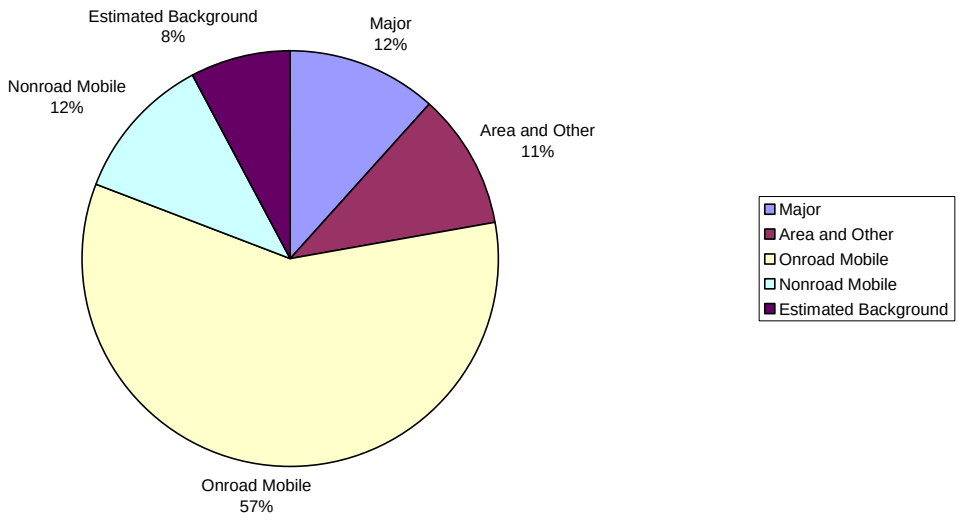
The Department has not conducted an exhaustive review of EPA's 1999 NATA data and assessment methodology for Scott County. Possible explanations for these results include:

1) The number and size of industries located in a relatively small area on both the Iowa and Illinois sides of the Mississippi River. Emissions from industry on the Illinois side of the river may be impacting Scott County;
2) Inaccuracies in the model inputs for one or more sources;
3) The relatively large number of people residing in relative proximity to these industries; and
4) The relatively high cancer potency values associated with arsenic and beryllium.

Scott County had the highest non-cancer, respiratory risk in the state for 1999, with a median HI of 2.88. However, the Scott County value was only slightly higher than other urban areas in the state, and was well below the national median HI of 6.39. The charts below show the primary pollutant and source contributors to the non-cancer, respiratory risk values in Scott County.

Scott County, IA: Pollutant Contributions to Non-Cancer Respiratory Risk





Next Steps for Scott County

As noted above, NATA has many limitations in its data and results. It may only be used as an indicator and a tool for setting priorities for further analysis.

The Department will conduct a thorough analysis of the 2002 data for Scott County (which will be used by EPA for its 2002 NATA), as well as the most current air toxics data available. This will include assessing emissions levels, as well as examining EPA's model inputs for areas where the cancer risk or Hazard Index are predicted to be higher than the national medians and averages.

As noted above, the Department has been monitoring benzene, acetaldehyde and formaldehyde in Davenport for several years. Monitoring has detected concentrations of these pollutants that exceed the 1 in one million cancer risk benchmark. The Department will continue to monitor these air toxics, as long as funds to support the monitoring are available.

The Department will also continue to work with the Bi-State Regional Commission Air Quality Task Force (Bi-State) to reduce pollution in the Quad Cities area, particularly through voluntary measures for mobile sources. The Department will assist Bi-State in identifying possible grant opportunities and risk reduction strategies for air toxics in the Quad Cities.